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Abstract

THE USE AND EVOLUTION OF THE CEA RESEARCH REACTORS

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The authors successively examine the different research reactors in use in the French C. E. A. Nuclear Centres. They trace briefly their histories, describing how they have been used up to the present, and how they have been adapted to changes in programme by means of certain modifications. They also describe the reasons which have led to the elaboration of the project for the new reactor OSIRIS.

ZOE, the oldest reactor in the CEA, has been in service in the Centre de Fontenay-aux-Roses since 1948. It is used mainly for measurements of absorption cross-sections in graphite, and for various short irradiations which do not require high fluxes.

The reactor EL 2, in service since 1952, was used for the first studies on gas cooling. It has also been widely used for the production of radioisotopes and for a large number of experiments in the fields of physics, metallurgy and physical chemistry. The ageing of certain elements of the reactor has led to the decision to close it down in the near future

The reactor EL 3 has been widely used for experiments in physics and in the investigation of fuels. The possibilities of the reactor in fast neutron irradiations will be considerably improved by the adoption of a new type of core (the "snow crystal" structure).

TRITON-I, a 2 MW swimming-pool reactor, is used for the most part for fast neutron and gamma irradiations. The modifications being carried out on it at present should result in an increase in the power of the reactor up to 4 or 5 MW. In a neighbouring compartment is housed TRITON-II which is of the same general structure as TRITON-I, but whose maximum power is 100 kW.

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TRITON-II is used solely for studies on shielding.

MELUSINE, a 2 MW swimming-pool reactor, has been in use in the Centre d'Etudes Nucléaires de Grenoble since 1959.

It has supported a very high programme concerned mainly with solid state physics, fundamental research into refractory fissile materials and special graphites, and the study of the behaviour of organic liquids under irradiation. The equipments of MELUSINE are now being modernized.

SILOE, another swimming-pool reactor, has been operating at 15 MW since the end of 1963. The performances achieved constitute a considerable progress in the field of swimming-pool reactors, since the fluxes obtained with SILOE are in the same order of magnitude than those which needed till now a tank type structure, whose numerous disadvantages in the fitting of experiments are well known. SILOE will be used mostly in the study of structural materials, graphites, refractory fissile materials, and for solid state physics.

The reactor PEGASE, in service in the Cadarache Nuclear Centre since 1963, is intended solely for testing full-scale fuel elements of EDF and EL 4 types. The current programme, for the eight loops of the reactor, covers the elements for the reactors EDF 2 EDF 3 and EL 4. New loops are in the course of being studied for the fuel elements of the EDF 4 and EDF 5 reactors.

The general line of the CEA programmes has shown up the considerable need for fast neutron irradiations. The reactor OSIRIS which is in the course of being constructed will serve to complement the CEA's equipment in this field and at the same time fill the gap which will be left in the near future in the Centre de Saclay by the closing down of EL 2. OSIRIS is a light water reactor whose special structure will allow it to function at 50 MW without the disadvantages usually associated with the presence of a heavy waterproof tank. This reactor, which should be put into service in 1966, is mainly intended for the investigation of structural materials, graphite and refractory fuels ; it will also serve to increase the production of high specific activity isotopes, and to develop activation analysis techniques.